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Integrating Blended Learning Method in Teaching of Computer Programming Course: Effect on Students' Achievement in Tertiary Institutions in Enugu State

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ABSTRACT

This study sought to ascertain the effect of integrating blended learning method in teaching and learning of computer programming course on students' achievement. Pre-test, post-test quasi experimental research design was adopted for the study. The population for the study comprised 872 undergraduates offering Computer Programming course in four tertiary institutions in Enugu State. The sample size was 126 respondents (second year students who were drawn from public universities). The researchers used purposive sampling approach to draw the sample size of 126. The instrument used for data collection was Computer Programming Achievement Test (CPAT) which was developed by the researchers and validated by three research experts. Kuder-Richardson 20 (K-20) formula was used to estimate the reliability of the instrument and a reliability index of .78 was obtained. A two-week training session was organized within the universities by the researchers for the regular computer programming lecturers. The lecturers for the experimental group used the blending learning method while the lecturers for the control group used the expository method. Mean and standard deviation were used for answering the research questions while Analysis of Covariance was used to test the null hypotheses. The findings of the study revealed that students who were taught computer programming by integrating blended learning method in the teaching process recorded increased achievement than their counterparts who were taught with the expository teaching approach. Based on the findings, the study recommends that Management staff of universities should provide lecturers with relevant facilities such as computers, storage devices and projectors; for integrating blended learning method in teaching practical based related courses like computer programming.

Keywords: Blended Learning Method, Computer Programming, Achievement

INTRODUCTION

The field of computer programming is evolving rapidly, necessitating innovative approaches to effectively educate students in this discipline. Computer programming courses provide individuals with the fundamental knowledge and skills required to create software, applications, and systems that drive the modern digital world. These courses are designed to equip students with a solid understanding of programming languages, algorithms, data structures, software development methodologies, and problem-solving techniques (Jeo, 2022). In the rapidly evolving field of technology, computer programming is a critical skill sought after by employers across various industries. It enables individuals to translate ideas into functional, interactive, and efficient software solutions. Whether one is interested in developing video games, mobile apps, web applications, artificial intelligence, or software for businesses, a foundation in programming is essential.

Despite the essential role of computer programming as a cornerstone in creating software, which powers a wide range of applications and systems, from mobile apps to operating systems to web platforms, the consistent under achievement of tertiary institutions students has been a longstanding issue of concern (Mannila and Shestakov, 2019). Mannila and Shestakov (2019), further stated that one of the factors contributing to this issue, is inadequate teaching methods.

Teaching methods and techniques used in the classrooms have been changing and this is influenced by technological advancements. T*eaching method* refers to the general principles, pedagogy and management strategies used for classroom instruction (Ezugwu, 2010). According to Ezugwu (2010), the dominant method of teaching and learning of computer studies in secondary schools today is the lecture method. This is same as expository teaching method. Ezugwu further noted that although this method may be convenient for some subjects and situations, it is not effective for most practical oriented subjects such as Computer Studies. Research findings have pointed out that Computer Studies is not left out in the list of subjects taught with the lecture method (Eze and Egbo, 2017). However, Ukeh, Okeke, Okechukwu, Eziokwu, Onovo and Orie (2020), criticized expository teaching method as not suitable for teaching science related contents. According to them, this instructional method is extremely didactic in approach, teacher-centered and does not lead to meaningful learning especially in an area like computer programming.

In this knowledge age, in which technology has been advancing and information has been rapidly increasing and refreshing, teachers working in educational environments requires more efforts to provide students with information by using effective technology-based methods (Abdulkareem, 2016). Meanwhile, a stronger learning environment has emerged with combining the strongest aspects of the two available approaches to remove the deficiencies of traditional learning and Web-based learning. According to Kazu and Demirkol (2014), this new learning approach is *blended learning*. In the ever-evolving landscape of education, the integration of innovative teaching methods is essential to enhance learning outcomes and prepare students for the dynamic challenges of the modern world. No wonder blended learning is gaining widespread recognition. This is because it is an approach that combines traditional face-to-face instruction with online learning experiences.

Blended learning involves a combination of self-learning computer-based courses with classroom organisations. Blended learning is a learning approach formed with the combination of the different learning environments and activity types for a certain group with the addition of electronic sources to the face to face learning (Bersin, 2014). Blended Learning popularly known as B-learning is an effective integration of face-to-face and online learning/E-learning to enhance the experience and through the utilization of ICT. Blended learning combines online delivery of educational content with the best features of classroom interaction (Obiedat, Eddeen, Harfoushi, Koury, AL-Hamarsheh and AL-Assaf, 2015). Viz and Kaur (2017), also defined blended learning as the integration of classroom face-to-face learning experiences with online learning experiences. Volchenkova (2016) pointed out that blended learning is a form of learning that combines the best of direct classroom learning and learning through the internet by using its applications. Blended learning offers a promising avenue to optimize the delivery of educational content, enabling a

more personalized and interactive learning experience for students. Garnham and Kaleta in Viz and Kaur (2017) defined blended learning as “hybrid” courses with a more sequential perspective as conventional courses with parts of their instructional activities running online, so that such an arrangement considerably cuts down the time students spend in face-to-face classrooms. Morgan (2012) explained that blended learning is conducted to blend the best aspects of online learning and face to face learning. Throne (2013) emphasized that the blending of these two learning approaches occurs by combining CD ROM, e-mail, conference, online animation, audio message, multimedia technology and real classroom environment and he added that it should be presented to the students with traditional classroom management and face to face learning. The use of blended learning method as an instructional strategy in teaching computer programming courses may have a positive effect on students' academic achievement.

A**cademic achievement refers to a student’s success in meeting short or long-term goals in education.** According to Anene (2015), achievement is quantified by a measure of the student’s academic standing in relation to those of other students of his age. La Shawn (2011) defined academic achievement as standardized test scores, grades, and overall academic ability and performance outcomes. Meanwhile, several studies have been carried to test the effectiveness of blended learning method over expository learning. Awodeyi, Akpan and Udo (2014), revealed that using a blended learning approach improved students’ achievement scores as compared to other approaches. Obiedat, et al. (2015), revealed that there is a significant and positive impact of blended learning on academic achievement of the students in University of Jordan. Chang, Quintana and Krajcik (2010), in their study which involved use of multimedia materials like blended learning strategy concluded that learning was more effective in the group taught with multimedia applications. One of the main benefits of blended learning is the opportunity for students to follow an individualized learning plan. It is worthy of note that blended learning, which is a pedagogical approach that combines traditional classroom instruction with online and digital learning experiences, has been associated with various positive effects on academic achievement. Beyond teaching strategies, gender has emerged as a noteworthy factor influencing students' academic achievement.

Gender encompasses a spectrum of physical, biological, mental, and behavioural attributes distinguishing between the feminine and masculine individuals (Adigun, Onihunwa, Irunokhai, Sada, and Adesina, 2015). Meanwhile, gender has been noted in existing literature as a significant factor that has effect on the academic achievement of students, particularly in science-related courses. However, the extent of gender's influence on students' academic success, specifically in the context of integrating blended learning methods, has not been definitively determined. For example, Bertea, as cited in Onyenma and Olele (2020), expressed the view that blended learning encourages active engagement from both male and female students. Likewise, a study by Lee, Yeh, Kung, and Hsu (2007) examined factors affecting learning in a blended e-Learning course for Mathematics, revealing no significant disparity in examination scores, learning attitudes, and learning portfolios between male and female students. Conversely, Adas and Abu Samais (2011) observed a notable difference in academic performance between female and male students exposed to blended learning. Hence, it is crucial to explore whether incorporating blended learning methods

produces varying effects on the academic accomplishments of male and female students pursuing computer programming. Against this backdrop, this study delved into investigating the effect of blended learning on the academic achievement of tertiary institution students in computer programming courses in Enugu State.

Statement of the Problem

The teaching and learning of computer science education contents like computer programming in tertiary institutions still remain a serious problem to the lecturers involved due to abstract nature of the course. Students' failure in computer programming examinations poses a lot of threat not only to science teaching and learning but also to technological development in Nigeria both now and in the future. Technological advancements have led to the proliferation of online educational resources such as videos, interactive simulations, e-books, and educational apps. Blended learning utilizes these resources to supplement traditional classroom instruction, providing students with a rich and diverse set of learning materials. The integration of blended learning methods in the teaching of computer programming courses has gained significant attention in recent years because it combines traditional face-to-face instruction with online learning components, providing students with a flexible and interactive learning experience. However, the effect of blended learning method in teaching of computer programming courses remains underexplored, hence, the need for the present study.

Purpose of the Study

The purpose of the study was to investigate the effect of blended learning method in teaching of computer programming course: Effect on students' achievement in tertiary institutions in Enugu State. Specifically, the study investigated the:

1. mean achievement scores and standard deviations of students taught computer programming with blended learning method and those taught using expository teaching method in both pre-test and post-test;
2. mean achievement scores and standard deviations of male and female students taught computer programming with blended learning method;

Research Questions

The following research questions guided the study:

1. What are the mean achievement scores and standard deviations of students taught computer programming with blended learning method and those taught using expository teaching method in both pre-test and post-test?
2. What are the mean achievement scores and standard deviations of male and female students taught computer programming with blended learning method?

Hypotheses

The following null hypotheses were formulated and were tested at .05 level of significance:

HO_1: There is no significant difference between the mean achievement scores of students taught computer programming with blended learning method and those taught using expository teaching method.

HO_2: There is no significant difference between the mean achievement scores of male and female students taught computer programming with blended learning method.

HO_3: There is no interaction effect of gender and methods (blended learning method and expository method) on students' achievement in computer programming.

Research Method

Pre-test, post-test quasi experimental research design was adopted for the study. Quasi experimental research design is described by Nworgu (2015) as the design where the treatment variable is manipulated but the groups not equated prior to manipulation of independent variable. The study area was Enugu State, Nigeria. The population for the study comprised 872 undergraduates offering Computer Programming course in four tertiary institutions in Enugu State. The sample size was 126 respondents (second year students who were drawn from public universities). The researchers used purposive sampling approach to draw the sample size of 126 (experimental group – 71(41 males and 30 females) and control group – 55) students. The instrument for data collection was a Computer Programming Achievement Test (CPAT). CPAT was developed by the researchers. CPAT consisted of two parts namely: A and B. Part A consisted of personal information of the students while Part B comprised 40 multiple choice questions with four options of A, B, C and D on Computer programming course.

The instrument was face and content validated by three research experts from the Department of Mathematics and Computer Education, Enugu University of Science and Technology (ESUT). The experts confirmed that the instrument was adequate for the test after their corrections. The validators made some comments which formed the basis for the modification of the items. Kuder-Richardson 20 (K-20) formula was used to estimate the reliability of the instrument and a reliability index of .78 was obtained. A two-week training session was organized within the universities by the researchers for the regular computer programming lecturers. The computer programming lecturers for the experimental group used the blended learning method while the lecturers for the control group used the expository method. Mean and standard deviation were used for answering the research questions while Analysis of Covariance was used to test the null hypotheses. The choice for the use of ANCOVA is because intact classes were used and initial differences cannot be guaranteed. The null hypothesis was rejected if probability value is less than or equal to the significant value of .05 ($P \leq 0.05$) and if otherwise ($P > .05$), it was not rejected.

Data Analysis and Results

Research Question 1: What are the mean achievement scores and standard deviations of students taught computer programming with blended learning method and those taught using expository method in both pre-test and post-test?

Table 1: Mean achievement scores and standard deviations of students taught computer programming with blended learning method and those taught using expository method

Groups	Number	Pre-test		Post-test		Mean Gain
		Mean ($\bar{x}$)	Standard Deviation (s)	Mean ($\bar{x}$)	Standard Deviation (s)	
Experimental	71	31.76	4.01	35.91	5.96	4.15
Control	55	29.08	3.57	32.88	4.57	3.80
Mean Diff.						**.35**

Table 1 shows that the mean achievement scores of students taught with blended learning method is higher than those taught using the expository method because the

gain in mean of 4.15 for the experimental group is greater than 3.80 gain in mean for the control group. The mean difference is .35 in favour of experimental group.

Research Question 2: What are the mean achievement scores and standard deviations of male and female students taught computer programming with blended learning method?

Table 2: Mean achievement scores and standard deviations of male and female students taught computer programming using blended learning method

Gender	Number	Pre-test		Post-test		Mean Gain
		Mean ($\bar{x}$)	Standard Deviation (s)	Mean ($\bar{x}$)	Standard Deviation (s)	
Male	41	30.92	4.95	34.65	5.56	3.73
Female	30	30.06	3.82	32.38	4.31	2.32
Mean Diff.						**1.41**

Table 2 shows that the mean achievement scores of male students taught with blended learning method is higher than that of their female counterparts because the gain in mean of 3.73 for the male students is greater than 2.32 gained in mean for the female students. The mean difference is 1.41 in favour of male students.

Ho_1: There is no significant difference between the mean achievement scores of students taught computer programming with blended learning method and those taught using expository method.

Table 3: Analysis of Covariance on the mean achievement scores of students taught computer programming using blended learning method and those taught using expository method

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Decision
Corrected Model	273.32	2	136.66	8.11	.000	Rejected
Intercept	306.55	1	306.55	46.671	.000	
Pretest	401.71	1	401.71			
Group	611.31	1	611.31	15.78	.000	
Error	240.84	124	.874	10.11	.080	
Total	1833.73	126				
Corrected Total	1811.54	125				

Table 3 shows that the calculated F value of 15.78 is significant at .000 which is less than the .05 significant level set for the study. Thus, the null hypothesis is rejected. This implies that a significant difference exists between the mean scores of students

taught computer programming using blended learning method and those taught using expository method.

Ho_2: There is no significant difference between the mean achievement scores of male and female students taught computer programming with blended learning method.

Table 4: Analysis of Covariance on the mean achievement scores of male and female students taught computer programming using blended learning method

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Decision
Corrected Model	178.72	2	89.36	9.06	.00	Rejected
Intercept	111.09	1	111.09	7.09	.00	
Pretest	304.09	1	304.09			
Gender	110.09	1	110.09	10.89	.00	
Error	803.07	69	14.041	8.25	.01	
Total	1507.06	71				
Corrected Total	1311.90	70				

Table 4 shows that the calculated F value is 10.89 which is found to be significant at .000. Since this significant level (0.000) is less than the .05 significant level set for the study, the null hypothesis is, accordingly, rejected. This means that there is a significant difference between the mean scores of male and female students taught computer programming using blended learning method.

Ho_3: There is no interaction effect of gender and methods (blended learning method and expository method) on students' achievement in computer programming.

Table 5: Analysis of Covariance on the interaction effect of gender and methods (blended learning and expository methods) on students' achievement in computer programming course

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Decision
Corrected Model	162.72	2	81.36	10.81	.00	
Intercept	144.51	1	144.51	30.54	.00	
Method*Gender	119.80	1	119.80	56.61	.01	Rejected
Error	871.24	124	24.20			
Total	1298.27	126				
Corrected Total	1179.61	125				

Table 5 shows that the calculated F value is 56.61 which is found to be significant at .01. Since this significant level (.01) is less than the .05 significant level set for the study, the

null hypothesis is, accordingly, rejected. This means that there is a significant interaction effect between method and gender in students' academic achievement scores.

Discussion of Findings

The research findings demonstrated that students who were taught computer programming using the blended learning method performed better academically compared to those taught using the expository method. In other words, the students in the blended learning group achieved higher learning outcomes, showcasing the effectiveness of this instructional approach. This finding aligns with earlier studies conducted by Awodeyi, Akpan, and Udo (2014), Kazu and Demirkol (2014), and Al-Qatawneh, Eltahir and Alsalhi, (2020). These previous studies had already suggested that the blended learning strategy produces more effective learning outcomes when compared to the traditional expository approach. The hypothesis tested showed that a significant difference existed between the mean scores of students taught computer programming using blended learning method and those taught using expository method.

The finding of the study further indicated that male students performed better in computer programming when exposed to blended learning methods compared to female students. The findings of the study are in line with Mahmoud, Ahmed and Mirna (2012) who reported a significant difference between male and female students who experienced blended learning strategy. The hypothesis tested showed that there was a significant difference between the mean scores of male and female students taught computer programming using blended learning method.

Conclusion

The study investigated the effect of blended learning method in teaching of computer programming course: Effect on students' achievement. The results of analysis revealed that students taught using blended learning method recorded higher achievement than those taught using expository teaching method. The integration of blended learning methods has proven to be an effective approach in enhancing students' achievement and proficiency in computer programming. As educators continue to adapt and refine their teaching strategies, integrating technology and online resources will undoubtedly remain a valuable tool for optimizing learning outcomes and preparing students for success in the ever-evolving field of computer programming.

Recommendations

Based on the findings, the following recommendations were proffered:

1. Management staff of universities should provide lecturers with relevant facilities such as computers, storage devices and projectors; for integrating blended learning method in teaching practical based related courses like computer programming.
2. Workshops, conferences or seminars should be organized by Ministry of Education on the need for integration of blended learning method in teaching process in order to enhance both male and female students' achievement.

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